



***Flammability Limits of Selected Polymers  
Commonly Used in American Spacecraft***

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Aerospace Testing Expo Europe 2006  
Hamburg, Germany  
April 6, 2006

# ***Topics***

- Background
- Review of current evaluation methods of aerospace materials flammability
- Review of flammability limits of commonly used spacecraft materials



## ***Flammability of Flight Hardware - Technical Requirements***

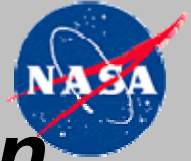
- Materials must meet NASA-STD-6001 requirements
- Material Usage Agreements (MUA) for hardware containing materials failing NASA STD 6001 requirements
- MUA's are supported by analysis per JSC 29353, Flammability Configuration Analysis for Spacecraft Applications

## ***Flight Hardware Configuration Flammability Assessment - JSC 29353***

- Evaluate the overall hardware configuration
- Evaluate the way in which the hardware will be used
- Identify the major materials to be assessed
- Determine fire propagation paths
- Evaluate ability of containers to contain fire

## *Test approach*

- Modified ASTM D 2863: Upward flame propagation in concurrent flows
- Tests conducted sequentially, with increasing/decreasing oxygen concentrations



## ***Some Polymers Commonly Used in Spacecraft and Their Terrestrial Flammability Limits***

- PTFE
- Nomex<sup>®</sup> HT 9040
- Graphite Epoxy composite
- Viton<sup>®</sup>
- Polyurethane foam
- Solimide
- Kynar
- Lexan<sup>®</sup>

## Slide 6

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d1      PTFE - ISS wire insulation, 49.2  
Nomex -  
Graphite epoxy composite  
Viton  
Solimide  
Kynar  
Lexan  
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## ***Some Polymers Commonly Used in Spacecraft and Their Terrestrial Flammability Limits (Cont'd)***

- PVC<sup>®</sup>
- ABS
- Delrin<sup>®</sup>
- Kevlar<sup>®</sup>
- Silicone
- Epoxy fiberglass composite
- Nylon<sup>®</sup>

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d2

PVC and ABS

Delrin

Kevlar

Silicone

Epoxy glass composite

Nylon

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## ***Conclusions and Recommendations***

- Flame propagation limits determined for common aerospace materials using modified existing test methods will allow extension of the knowledge base for other environments than those which are currently used in spacecraft
- The design of Crew Exploration Vehicle and extraterrestrial habitats may benefit from such data
- Additional evaluations of other advanced materials is recommended